

What is claimed is:

1. A method for manufacturing a semiconductor device, the method comprising the steps of:

- 5 (a) forming an oxide film for a storage electrode on an entire surface of a semiconductor substrate comprising a cell area and a peripheral circuit area;
- (b) etching the oxide film for storage electrode in the cell area to define a storage electrode area;
- (c) forming a storage electrode in the storage electrode area;
- 10 (d) forming a photoresist film pattern on the oxide film for storage electrode in the peripheral circuit area;
- (e) removing the oxide film for storage electrode in the cell area via a wet etching process using the photoresist film pattern as a mask, and removing the photoresist film pattern;
- 15 (f) sequentially forming a dielectric film and a plate electrode on the entire surface of the resulting structure; and
- (g) forming an interlayer insulating film on the entire surface of the resulting structure.

- 20 2. The method according to claim 1, wherein step (e) comprises removing the oxide film for the storage electrode in the cell area in a BOE (Buffered Oxide Etchant) solution bath using the photoresist film pattern as a mask, and removing the photoresist film pattern of the resulting structure in a Piranha solution bath, and further comprises cleaning the resulting structure in an SC-1 solution bath and
- 25 cleaning the resulting structure in a diluted HF solution bath.

3. The method according to claim 2, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 ranges from 2 : 1 to 6 : 1, and has a temperature ranging from 90 to 130°C.

- 30 4. The method according to claim 2, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 is 4 : 1, and has a temperature of 120°C.

5. The method according to claim 2, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O ranging from 1 : 1 : 20 to 1 : 5 : 50, and has a temperature ranging from 25 to 85°C.
- 5 6. The method according to claim 2, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O is 1 : 4 : 20, and has a temperature of 65°C.
7. The method according to claim 1, wherein step (e) comprises removing
10 the oxide film for the storage electrode in the cell area in a BHF (Buffered Hydrogen Fluoride) solution bath by using the photoresist film pattern as a mask, cleaning the resulting structure in a pure water bath, and removing the photoresist film pattern of the resulting structure in a Piranha solution bath, and further comprises cleaning the resulting structure in a pure water bath, and drying the resulting structure in a dryer.
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8. The method according to claim 7, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 ranging from 2 : 1 to 6 : 1, and has a temperature ranging from 90 to 130°C.
- 20 9. The method according to claim 7, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 is 4 : 1, and has a temperature of 120°C.
10. The method according to claim 7, further comprising cleaning the
25 resulting structure in an SC-1 solution, and cleaning the resulting structure in a pure water bath, prior to the drying of the resulting structure in a dryer.
11. The method according to claim 7, further comprising cleaning the
30 resulting structure in an SC-1 solution bath, cleaning the resulting structure in a pure water bath, cleaning the resulting structure in a diluted HF solution bath, and cleaning the resulting structure in a pure water bath, prior to the drying of the resulting structure in a dryer.

12. The method according to claim 7, further comprising cleaning the resulting structure in a diluted HF solution bath, cleaning the resulting structure in a pure water bath, cleaning the resulting structure in an SC-1 solution bath, and cleaning the resulting structure in a pure water bath, prior to the drying of the resulting structure in a dryer.

13. The method according to claim 10, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O ranging from 1 : 1 : 20 to 1 : 5 : 50, and has a temperature ranging from 25 to 85°C.

14. The method according to claim 10, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O is 1 : 4 : 20, and has a temperature of 65°C.

15. A method for manufacturing a semiconductor device, comprising:

(a) removing an oxide film for storage electrode in a cell area of a semiconductor substrate, wherein a storage electrode is disposed in the cell area, and a photoresist film pattern is disposed in peripheral circuit region of the semiconductor substrate by performing a wet etching process in a BHF (Buffered Hydrogen Fluoride) solution bath;

(b) cleaning the resulting structure in a pure water bath;
(c) removing the photoresist film pattern in a Piranha solution bath;
(d) cleaning the resulting structure in a pure water bath; and
(e) drying the resulting structure in a dryer.

16. The method according to claim 15, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 ranging from 2 : 1 to 6 : 1, and has a temperature ranging from 90 to 130°C.

17. The method according to claim 15, wherein the Piranha solution comprises H_2SO_4 and H_2O_2 , the volume ratio of the H_2SO_4 to H_2O_2 is 4 : 1, and has a temperature of 120°C.

18. The method according to claim 15, further comprising cleaning the resulting structure in an SC-1 solution bath, and cleaning the resulting structure in a pure water bath, prior to the drying of the resulting structure in a dryer.

5 19. The method according to claim 15, further comprising cleaning the resulting structure in an SC-1 solution bath, cleaning the resulting structure in a pure water bath, cleaning the resulting structure in a diluted HF solution bath, and cleaning the resulting structure in a pure water bath, prior to the drying of the resulting structure in a dryer.

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20. The method according to claim 15, further comprising cleaning the resulting structure in a diluted HF solution bath, cleaning the resulting structure in a pure water bath, cleaning the resulting structure in an SC-1 solution bath, and cleaning the resulting structure in a pure water bath, prior to the drying of the
15 resulting structure in a dryer.

21. The method according to claim 18, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O ranging from 1 : 1 : 20 to 1 : 5 : 50, and has a temperature ranging from 25 to 85°C.

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22. The method according to claim 18, wherein the SC-1 solution comprises NH_4OH , H_2O_2 and H_2O , the volume ratio of the NH_4OH , H_2O_2 and H_2O is 1 : 4 : 20, and has a temperature of 65°C.